

1997 Chevrolet S10 Pickup

2.2L 4-CYL - VIN [4] 1996-97 ENGINES General Motors Corp. 2.2L 4-Cylinder VIN [4]

2.2L 4-CYL - VIN [4]

1996-97 ENGINES General Motors Corp. 2.2L 4-Cylinder VIN [4]

ENGINE IDENTIFICATION

VEHICLE IDENTIFICATION NUMBER (VIN)

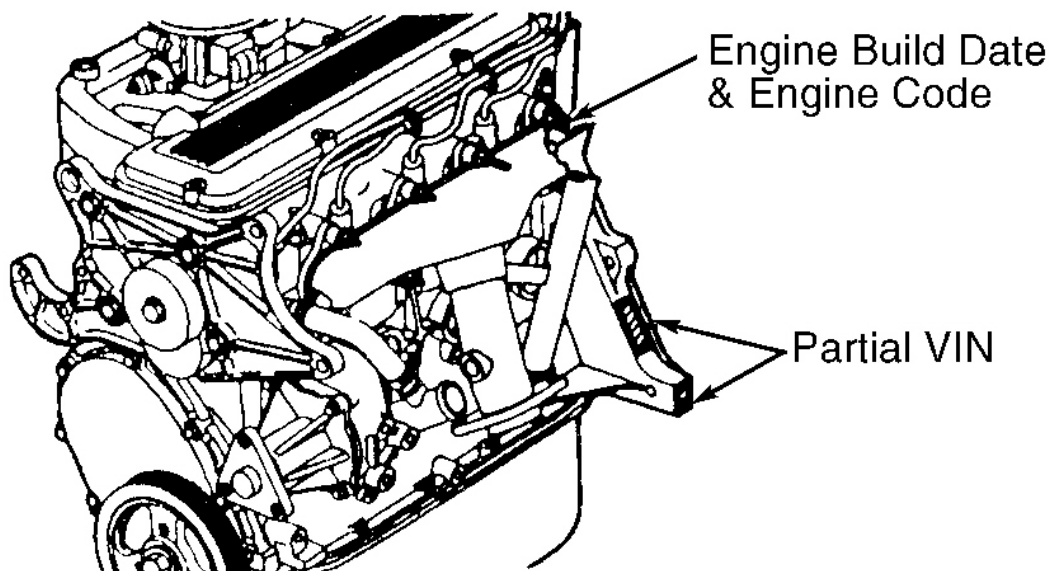
The VIN is stamped on a metal pad located near lower left corner of windshield. A "4" in the eighth character of VIN identifies 2.2L 4-cylinder engine.

ENGINE BUILD DATE & ENGINE CODE

The engine build date (month and day) and the engine code are stamped on left side of cylinder block, near cylinder head. See **Fig. 1** . Engine code LN2 indicates 2.2L 4-cylinder engine.

PARTIAL VIN

A partial VIN (9 characters) is stamped on lower left side of cylinder block, at cylinder block-to-transmission flange. See **Fig. 1** .



G93E39283

Fig. 1: Locating Engine Build Date, Engine Code & Partial VIN
Courtesy of GENERAL MOTORS CORP.

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ADJUSTMENTS

VALVE CLEARANCE ADJUSTMENT

Engine is equipped with non-adjustable hydraulic valve lifters.

TROUBLE SHOOTING

NOTE: To trouble shoot engine mechanical components, see appropriate table in TROUBLE SHOOTING article in GENERAL INFORMATION.

REMOVAL & INSTALLATION

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION before disconnecting battery.

NOTE: For reassembly reference, label all electrical connectors, vacuum hoses and fuel lines before removal. Also place mating marks on engine hood and other major assemblies before removal.

FUEL PRESSURE RELEASE

Loosen fuel tank filler cap to release tank vapor pressure (DO NOT tighten at this time). Remove fuel pump fuse. Start and run engine until engine stops. Engage starter for at least 3 seconds to ensure remaining fuel pressure is released. Disconnect negative battery cable. Reinstall fuel pump fuse. Some residual line pressure may exist. Cover fuel lines using shop towel before disconnecting.

ENGINE

NOTE: Remove engine through top of engine compartment.

Removal & Installation

1. Release fuel system pressure. See FUEL PRESSURE RELEASE . Disconnect negative battery cable. Disconnect under hood light. Remove vacuum reservoir from hood. Disconnect windshield washer fluid line from hood. Remove outer cowl vent grilles. Remove hood. Raise vehicle.
2. Drain engine oil and coolant. Discharge A/C system using approved refrigerant recovery/recycling equipment (if equipped). Remove oxygen sensor. Disconnect exhaust at manifold and loosen hanger at converter.
3. Remove pencil braces from engine to transmission. Remove inspection cover. Remove starter motor. Remove long bolts at engine mount. Remove bell housing bolts. Lower vehicle.

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4. Remove battery from vehicle and disconnect body ground. Remove fan shrouds and fan. Remove serpentine belt. Remove upper radiator hose. Remove A/C compressor (if equipped) and lay it aside. Remove lower radiator hose.
5. Remove radiator. Disconnect power steering lines from pump. Disconnect heater hoses from engine. Disconnect wiring harness from engine. Disconnect vacuum lines, throttle cable and fuel lines.
6. Support transmission. Install engine hoist. Raise engine slightly. Remove left engine mount. Remove engine from vehicle. To install, reverse removal procedure.

INTAKE MANIFOLD

Removal

1. Release fuel system pressure. See **FUEL PRESSURE RELEASE** . Disconnect negative battery cable. Remove air intake duct. Remove MAP sensor and EGR solenoid valve. Disconnect vacuum hoses, electrical connectors, and fuel lines from upper intake manifold. Remove bolts and upper intake manifold.
2. Disconnect wiring and fuel lines from lower intake manifold. Disconnect spark plug wires from DIS coil pack. Remove nuts, lower intake manifold, and gasket.

Installation

To install, reverse removal procedure using NEW gaskets. Tighten nuts in sequence to specification. See **TORQUE SPECIFICATIONS** . See **Fig. 2** and **Fig. 3** . Fill cooling system.

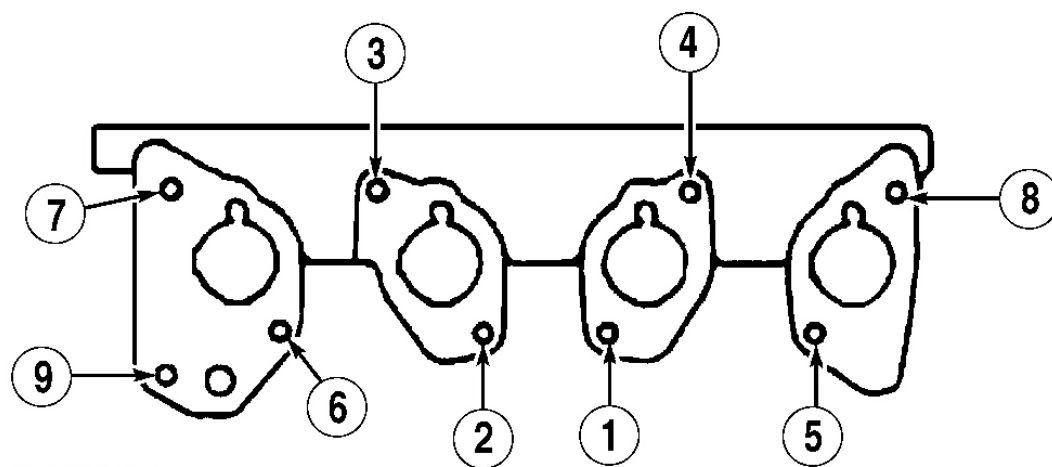


Fig. 2: Lower Intake Manifold Nut Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

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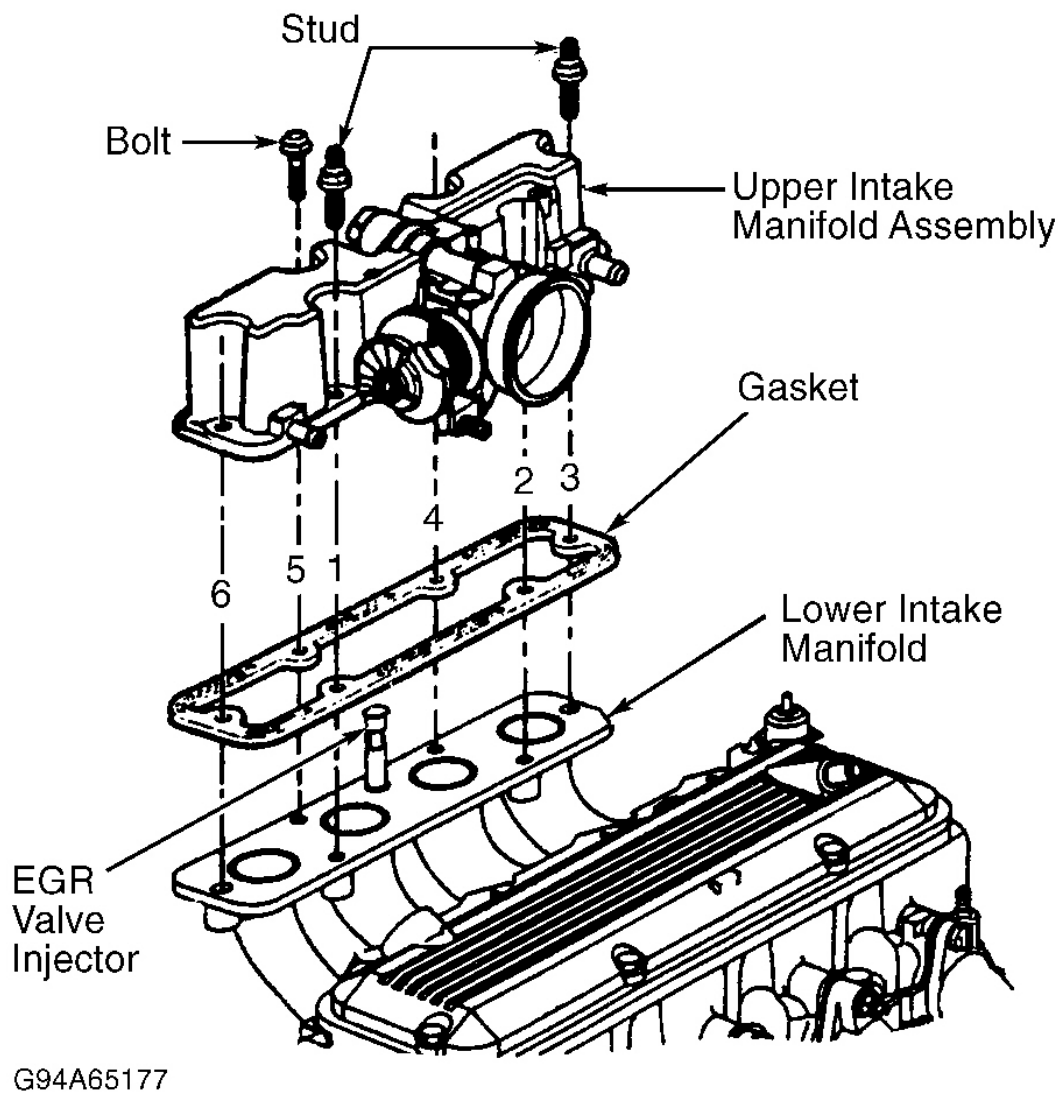


Fig. 3: Upper Intake Manifold Nut Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

EXHAUST MANIFOLD

Removal

Disconnect negative battery cable. Remove air cleaner and duct work. Disconnect oxygen sensor electrical connector. Remove oil fill tube assembly. Disconnect exhaust pipe from exhaust manifold. Remove exhaust manifold nuts. Remove exhaust manifold and gasket.

Installation

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To install, reverse removal procedure using NEW gasket. Tighten nuts to specification. See **TORQUE SPECIFICATIONS** .

CYLINDER HEAD

Removal

1. Release fuel system pressure. See FUEL PRESSURE RELEASE under **REMOVAL & INSTALLATION** . Remove air intake duct. Drain cooling system.
2. Disconnect vacuum hoses, electrical connectors and control cables from throttle body. Remove coolant reservoir, serpentine drive belt and generator.
3. Remove power steering pump (leave hoses connected, and lay pump aside). Remove serpentine drive belt tensioner and spark plug wires. Disconnect canister purge hose, upper radiator hose and heater hoses from intake manifold.
4. Remove intake manifold bracket from power steering bracket. Disconnect fuel lines as necessary. Remove valve cover. See **Fig. 4** . Loosen rocker arm nuts, rotate rocker arms to one side and remove push rods.
5. Remove spark plug wire bracket and engine lifting bracket. Disconnect exhaust pipe from exhaust manifold. Remove cylinder head bolts. Remove transmission fluid level indicator bracket (A/T). Remove cylinder head.

Inspection

Inspect cylinder head for warpage at deck surface and manifold surfaces. DO NOT remove more than .010" (.25 mm) material from cylinder head deck surface.

Installation

1. Ensure cylinder head bolt threads and cylinder block bolt hole threads are clean. Install NEW head gasket over dowel pins, and ensure all holes align with cylinder block.
2. Install cylinder head. Tighten cylinder head bolts to specification in proper sequence. See **TORQUE SPECIFICATIONS** . See **Fig. 5** . To complete installation, reverse removal procedure. Fill cooling system.

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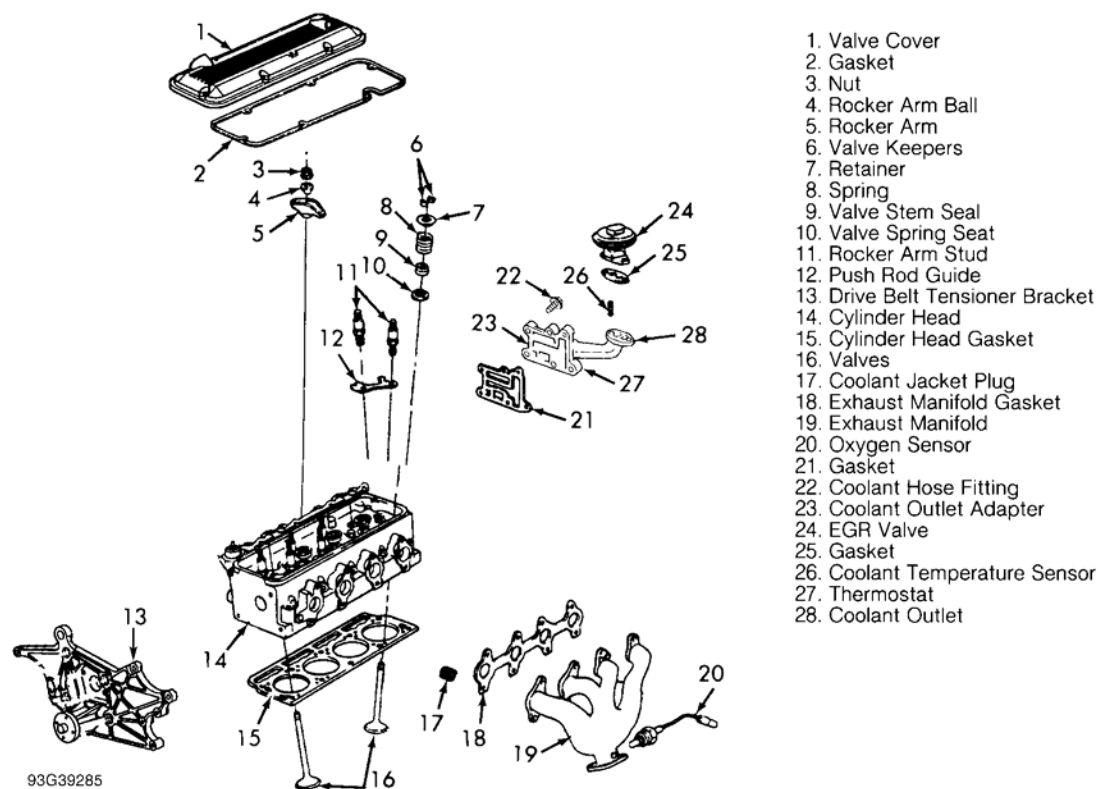
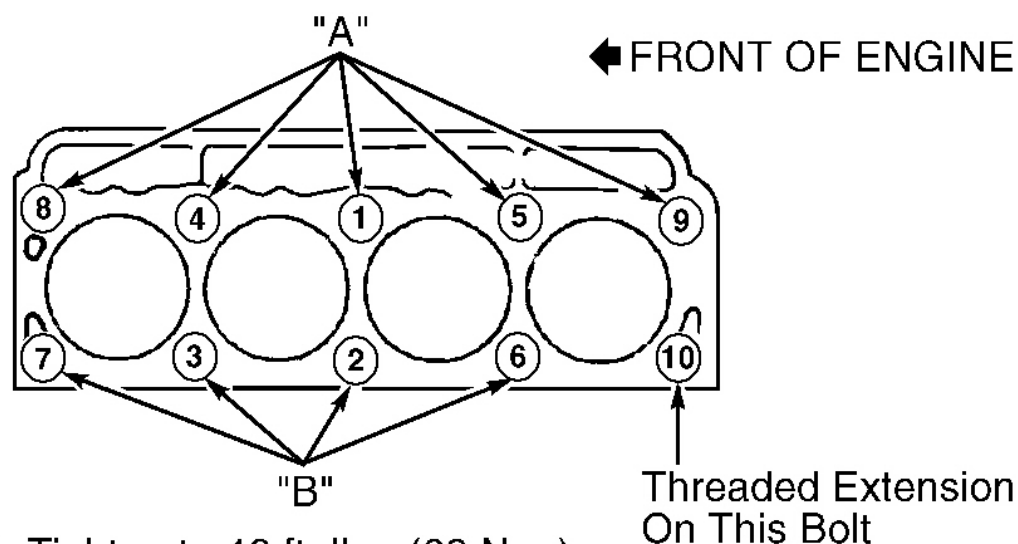


Fig. 4: Exploded View Of Cylinder Head & Components (S10 Pickup)

Courtesy of GENERAL MOTORS CORP.

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A. Tighten to 46 ft. lbs. (62 N.m)

B. Tighten to 43 ft. lbs. (58 N.m)

NOTE: Tighten each bolt an additional 90 degrees.

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Fig. 5: Cylinder Head Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

FRONT COVER

Removal

1. Disconnect negative battery cable. Remove oil pan. See **OIL PAN** . Remove serpentine drive belt. Remove power steering pump (leave hoses connected). Remove generator (leave wiring connected). Remove drive belt tensioner. Raise and support vehicle.
2. Remove right front wheel. Remove engine splash shield. Remove bolt from center of crankshaft pulley. Remove 3 crankshaft pulley bolts. Using a puller, remove crankshaft pulley hub. If replacing seal, pry seal from front cover with a large screwdriver (DO NOT distort front cover). Remove bolts and front cover.

CAUTION: To prevent oil leakage, apply RTV sealant to keyway of crankshaft pulley hub before installing hub.

Installation

1. Install front cover and NEW gasket. Tighten front cover bolts to specification. See **TORQUE**

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SPECIFICATIONS . If seal was removed, apply engine oil to lip of NEW oil seal, then install using Seal Installer (J-35468). Apply RTV sealant to crankshaft pulley hub keyway.

2. Install crankshaft pulley hub using Hub Installer (J-29113), ensuring at least .24" (6.0 mm) of installer bolt thread is engaged into end of crankshaft. To complete installation, reverse removal procedure. Tighten nuts and bolts to specification. See **TORQUE SPECIFICATIONS** .

FRONT COVER OIL SEAL

Removal

Disconnect negative battery cable. Remove serpentine drive belt. Raise and support vehicle. Remove right front wheel. Remove engine splash shield. Remove bolt from center of crankshaft pulley. Remove 3 crankshaft pulley bolts. Using a puller, remove crankshaft pulley hub. Pry seal from front cover with a large screwdriver or seal puller. DO NOT distort front cover.

CAUTION: To prevent oil leakage, apply RTV sealant to keyway of crankshaft pulley hub before installing hub.

Installation

1. Apply engine oil to lip of NEW oil seal. Using Seal Install (J-35468), drive seal into front cover with seal lip toward engine. Ensure seal is fully seated. Apply RTV sealant to crankshaft pulley hub keyway. Position crankshaft pulley hub onto crankshaft.
2. Install crankshaft pulley hub using Hub Installer (J-29113), ensuring at least .24" (6.0 mm) of installer bolt thread is engaged into end of crankshaft. To complete installation, reverse removal procedure. Tighten nuts and bolts to specification. See TORQUE SPECIFICATION.

TIMING CHAIN & SPROCKETS

Removal

1. Remove front timing case cover. See FRONT TIMING COVER. Align timing marks on camshaft sprocket and crankshaft sprocket with tabs on chain tensioner. See **Fig. 6** .
2. Remove timing chain tensioner upper bolt. Loosen but DO NOT remove timing chain tensioner Torx bolt. Remove camshaft sprocket bolt. Remove camshaft sprocket and timing chain. Using Sprocket Puller (J-22888-20A), remove crankshaft sprocket.

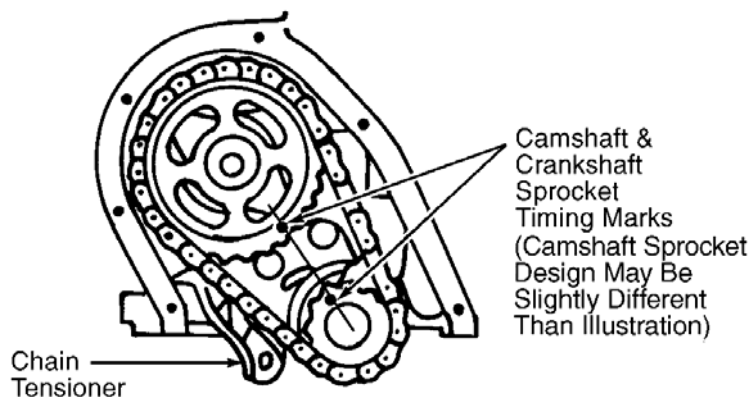
Installation

1. Install crankshaft sprocket using Sprocket Installer (J-5590). Ensure crankshaft sprocket is fully seated against crankshaft. Compress chain tensioner spring, and install a cotter pin or nail in hole of chain tensioner. See **Fig. 6** .
2. Install timing chain and camshaft sprocket, aligning sprocket marks on sprockets with tabs on chain tensioner. Ensure hole in camshaft sprocket aligns with camshaft dowel pin. Install camshaft sprocket bolt and tighten to specification. See **TORQUE SPECIFICATIONS** .

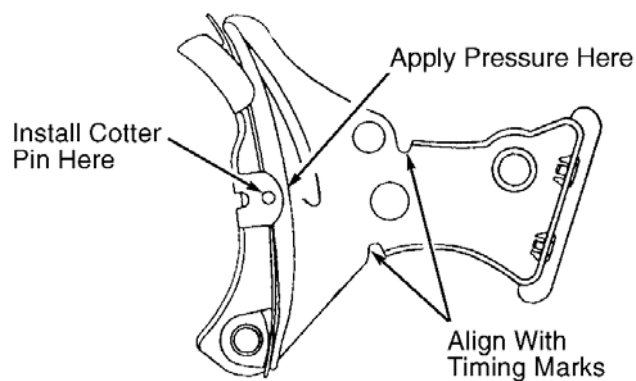
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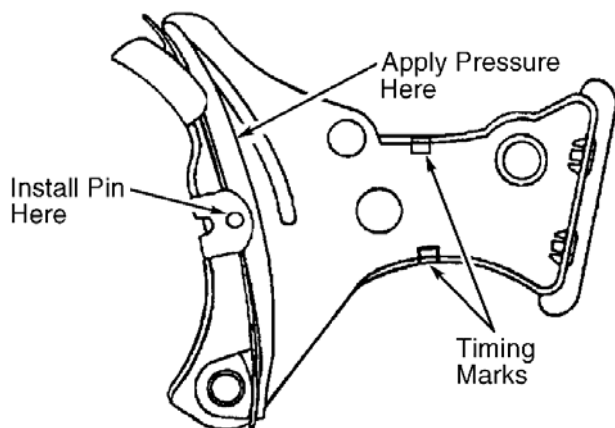
3. Install and tighten chain tensioner upper bolt. Tighten chain tensioner Torx bolt. Remove cotter pin from chain tensioner. Lubricate timing chain with oil. To complete installation, reverse removal procedure.



ALIGNING SPROCKET MARKS



COMPRESSING CHAIN TENSIONER EARLY STYLE



LATE STYLE

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Fig. 6: Aligning Timing Marks & Compressing Chain Tensioner

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Courtesy of GENERAL MOTORS CORP.

VALVE LIFTERS

Removal

Remove cylinder head. See **CYLINDER HEAD** . Remove anti-rotation brackets. See **Fig. 7** . Remove lifters (note location for reassembly reference).

NOTE: **Verify use of oversize valve lifters. Oversize valve lifters are identified by a mark on cylinder block, near lifter bore. If installing new lifter, coat bottom of lifter with Camshaft Lubricant (1052365) before installation.**

Installation

Install lifters in original locations. To complete installation, reverse removal procedure.

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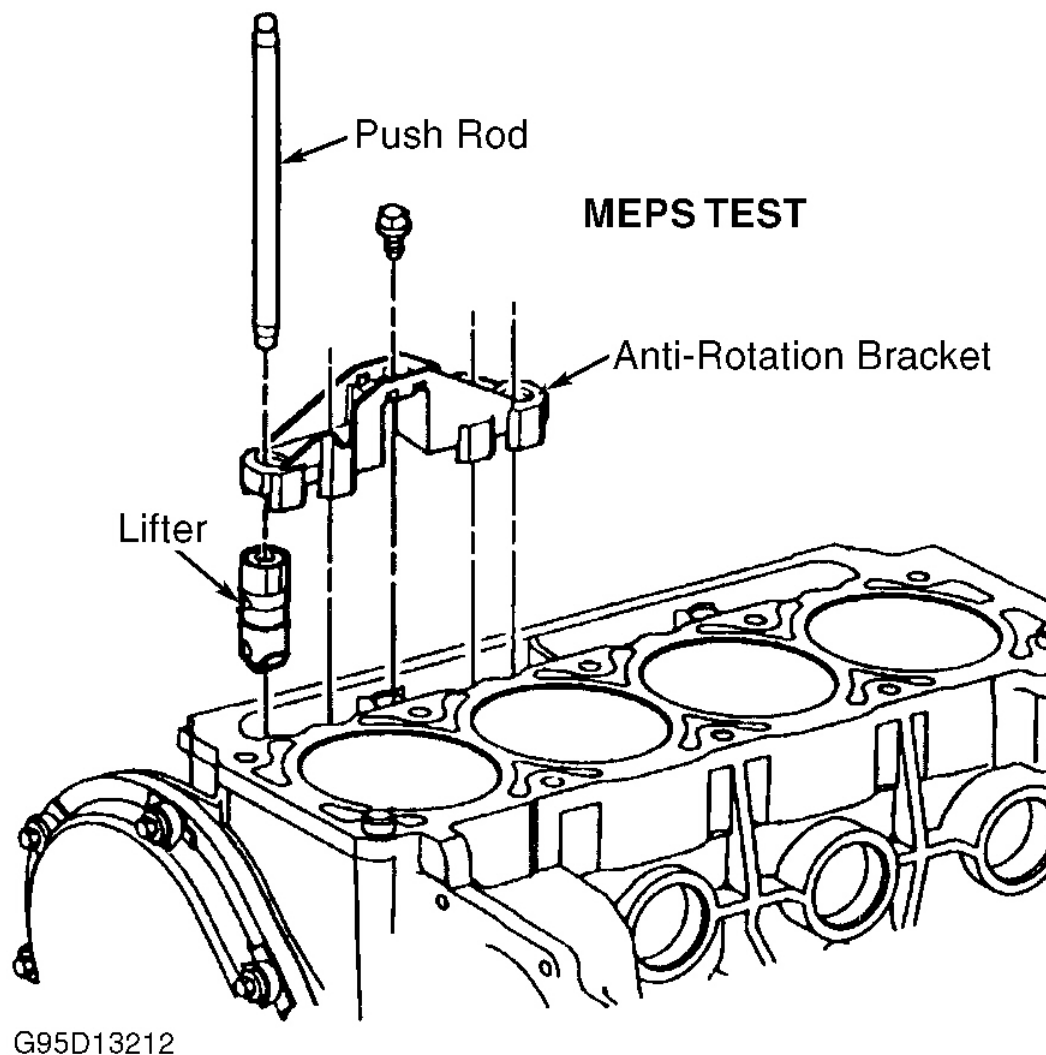


Fig. 7: Identifying Push Rod, Anti-Rotation Bracket & Lifter
Courtesy of GENERAL MOTORS CORP.

CAMSHAFT

NOTE: To replace camshaft, engine must be removed from vehicle.

Removal

Remove engine. See **ENGINE** . Remove Cylinder head, valve lifters front cover, timing chain and camshaft sprocket. Remove oil pump drive from right side of cylinder block. Remove camshaft thrust plate. Remove camshaft. If necessary , use Camshaft Bearing Remover/Installer (J-33049) to remove camshaft bearings.

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Inspection

Inspect camshaft journal diameter, lobe lift and oil clearance. Replace components if not within specification. See CAMSHAFT table under ENGINE SPECIFICATIONS.

CAUTION: If installing new camshaft, Replace all lifters and add GM EP Lubricant (1051396) to engine oil. Verify use of oversize valve lifters. Oversize lifters are identified by mark on cylinder block, near lifter bore.

Installation

Install camshaft bearings (if removed), ensuring oil holes are aligned. Coat camshaft journals and bearings with Lubricant (1051396). Install camshaft. Install camshaft thrust plate. To complete installation, reverse removal procedure.

CRANKSHAFT REAR OIL SEAL

Removal

Remove transmission or transaxle. Remove flexplate/flywheel. See TRANSMISSION REMOVAL & INSTALLATION - M/T article (M/T models) or TRANSMISSION REMOVAL & INSTALLATION - A/T (A/T models). Pry seal from housing, being careful not to damage sealing surface of crankshaft. Note direction of seal installation.

Installation

1. Coat inner and outer seal surfaces with engine oil. Install seal on mandrel of Seal Installer (J-34686) until dust lip bottoms against tool collar. See **Fig. 8** . Align seal installer dowel pin with alignment hole of crankshaft. Install seal installer on crankshaft.
2. Tighten seal installer bolts to 27-62 INCH lbs. (3-7 N.m). Tighten seal installer handle until collar is even with cylinder block. Remove seal installer. To complete installation, reverse removal procedure. Apply thread locking compound to flexplate/flywheel bolts.

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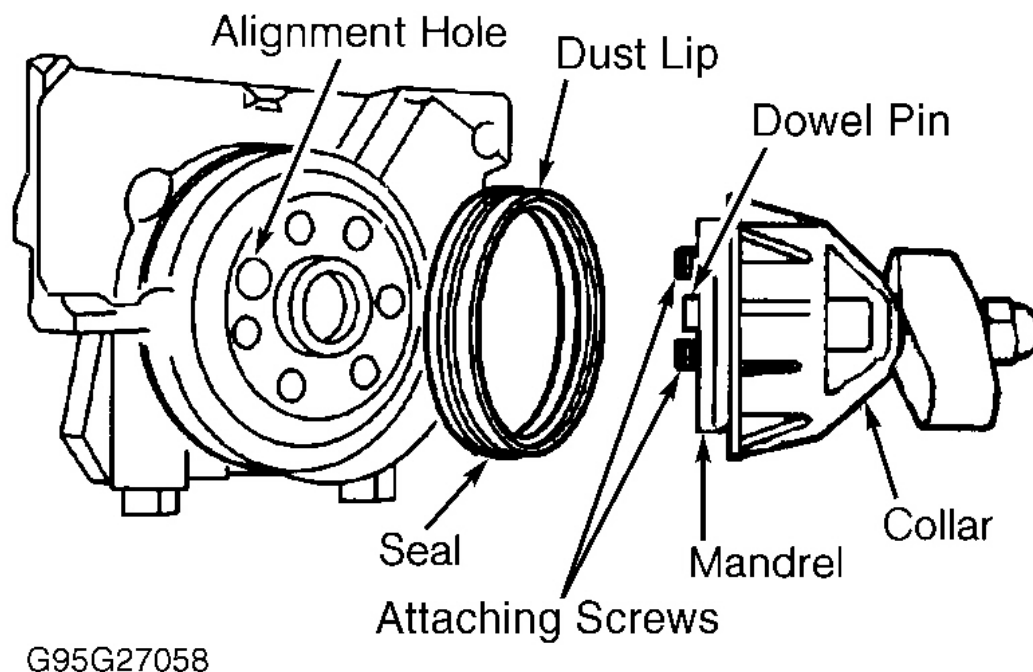


Fig. 8: Installing Rear Crankshaft Seal
Courtesy of GENERAL MOTORS CORP.

WATER PUMP

Removal & Installation

Disconnect negative battery cable. Drain cooling system. Loosen water pump pulley bolts. Remove serpentine drive belt. Remove generator and brackets (if necessary). Remove water pump pulley. Remove water pump gasket. To install, reverse removal procedure. Use NEW gasket. Fill cooling system.

OIL PAN

NOTE: This procedure requires engine to be supported from top.

Removal

Remove engine from vehicle. See ENGINE.

Installation

Apply a 1/8" (2 mm) bead of RTV sealant to ears of NEW oil pan rear seal. Install seal onto bottom of rear main bearing cap. Install oil pan. To complete installation, reverse removal procedure. Tighten oil pan bolts to

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specification. See **TORQUE SPECIFICATIONS** . Fill crankcase.

OVERHAUL

CYLINDER HEAD

Gasket Surfaces

If warpage of head gasket surface or manifold surfaces exceeds specification, resurface or replace cylinder head as necessary. See **CYLINDER HEAD** table under ENGINE SPECIFICATIONS. DO NOT remove more than .101" (.25 mm) material from head gasket surface.

Valve Springs

If valve spring free length, out-of-square, or pressure is not within specification, replace valve spring. See VALVES & VALVE SPRINGS table under **ENGINE SPECIFICATIONS** .

Valve Stem Oil Seals

If installing oversize valves, use oversize seals. Ensure seal is fully seated on guide. Intake and exhaust seals are different.

Valve Guides

If oil clearance exceeds specification, ream valve guides for .005" (.13 mm) oversize valves. See **CYLINDER HEAD** table under ENGINE SPECIFICATIONS. DO NOT knurl valve guides.

Valve Seats

If valve seat runout and width are not within specification, machine valve seat or replace cylinder head as necessary. See **CYLINDER HEAD** table under ENGINE SPECIFICATIONS.

Valves

If valve head margin is not within specification, replace valve. See **VALVES & VALVE SPRINGS** table under ENGINE SPECIFICATIONS. Machine valve face if rough.

Valve Seat Correction Angles

If seat contact is too close to margin, machine seat with a 30-degree stone. If seat contact is too close to stem, machine seat with a 45-degree stone. If seat is too narrow, widen it with a 45-degree stone. If seat is too wide, narrow it with a 60-degree stone.

CYLINDER BLOCK ASSEMBLY

CAUTION: Before disassembly, mark all parts for reassembly reference.

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Piston & Assembly

Mark piston in relation to connecting rod for reassembly reference. Install piston with arrow on top of piston toward front of engine.

Fitting Pistons

Measure cylinder bore diameter at center of bore. Measure piston diameter at 90-degree angle to piston pin .4" (10 mm) above bottom of piston skirt. Determine piston clearance. If piston clearance is not within specification, machine cylinder bore and/or install oversize piston as necessary. See PISTON, PINS & RINGS table and **CYLINDER BLOCK** table under ENGINE SPECIFICATIONS.

Piston Rings

Measure piston ring end gap and side clearance. If end gap and side clearance are not within specification, replace piston rings and/or piston as necessary. See POISONS, PINS & RINGS table under ENGINE SPECIFICATIONS. Install piston rings with identification mark on ring land facing top of piston. Properly position ring end gaps around circumference of piston. See **Fig. 9**.

Rod Bearings

If rod bearing oil clearance is not within specification, machine crankshaft rod bearing journals and install undersize bearings. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS.

Crankshaft & Main Bearings

If crankshaft main bearing oil clearance, out-of-round or taper is not within specification, machine crankshaft main bearing journals and install undersize bearings. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under **ENGINE SPECIFICATIONS**.

Thrust Bearing

Thrust bearing is part of main bearing No. 4. Pry crankshaft toward rear of engine. Measure clearance between thrust bearing face and crankshaft. If clearance is not within specification, replace thrust bearing and/or crankshaft.

Deck Surface Warpage

If deck surface warpage exceeds specification, machine or replace cylinder block. DO NOT remove more than .010" (.25 mm) material from deck surface.

Valve Lifter Bores

Oversize valve lifters are available to compensate for excessive clearance between lifter and bore. Oversize lifter is indicated on cylinder block, near lifter bore.

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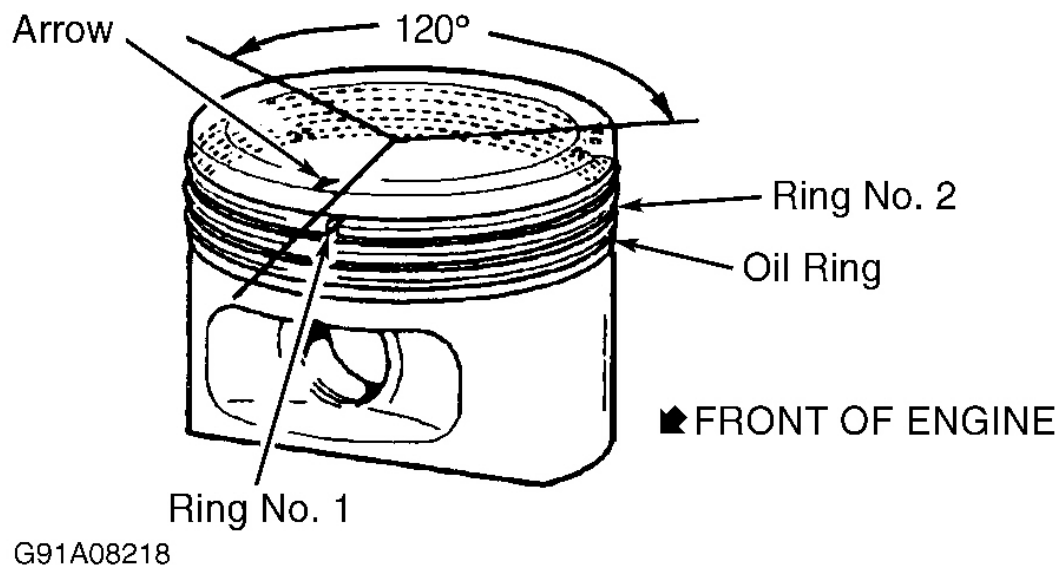


Fig. 9: Positioning Piston Ring End Gaps
Courtesy of GENERAL MOTORS CORP.

ENGINE OILING

ENGINE LUBRICATION SYSTEM

A camshaft-driven, gear-type oil pump is mounted at bottom of cylinder block and is accessible with oil pan removed. Oil pump supplies pressurized oil to internal passages of cylinder block. Internal passages intersect with hydraulic valve lifter bosses where oil flows to main and camshaft bearings and lifters. See **Fig. 10** .

Crankcase Capacity

Engine oil capacity is about 4 qts. (3.8L) without oil filter change. When changing oil filter, add more oil if necessary.

Oil Pressure

Normal oil pressure is 56 psi (3.9 kg/cm²) at 3000 RPM.

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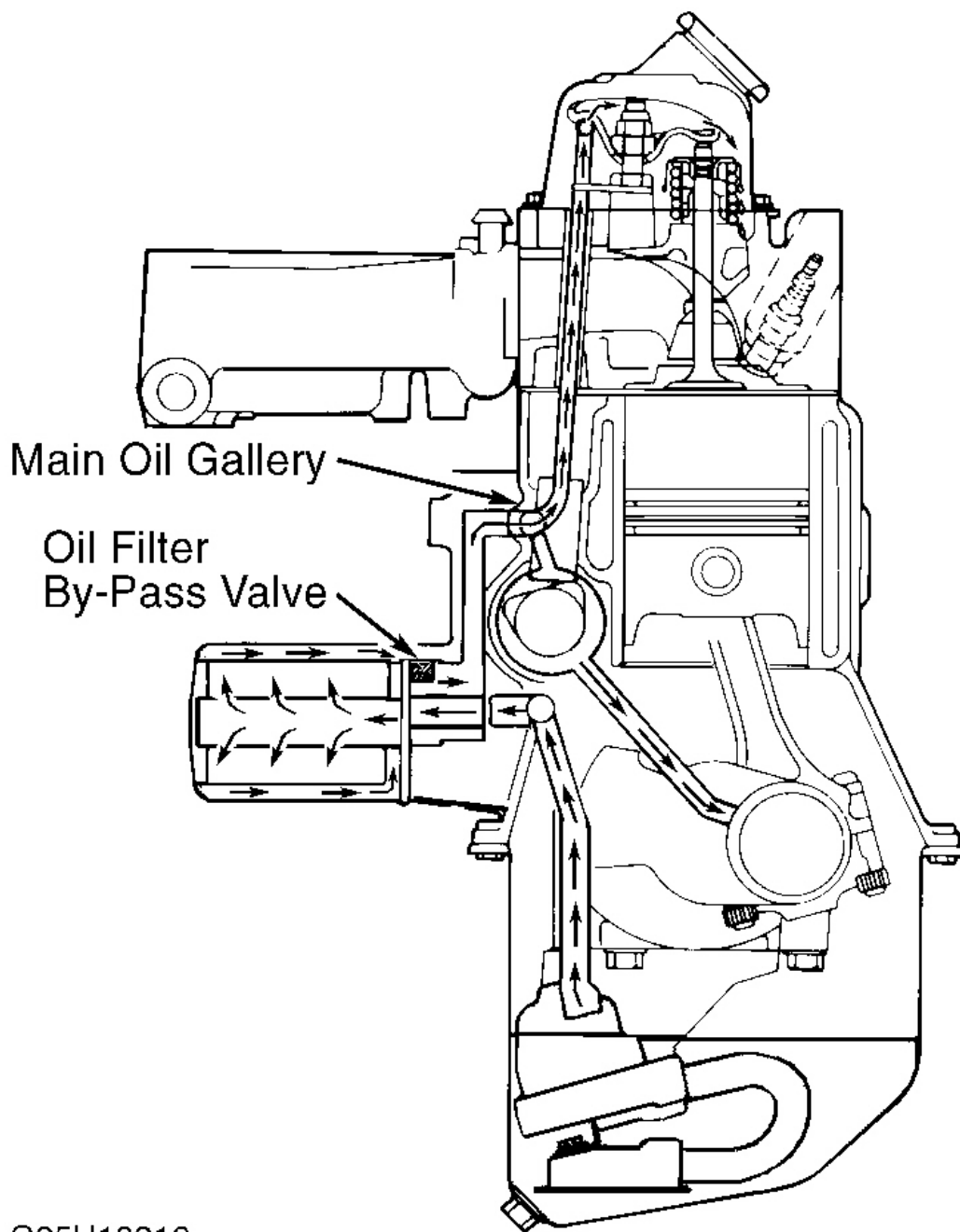


Fig. 10: Cross-Sectional View Of Engine Oil Circuit (Typical)
Courtesy of GENERAL MOTORS CORP.

OIL PUMP

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WARNING: Pressure regulator valve spring is under pressure. Use caution when removing retaining pit to prevent bodily injury.

Removal & Disassembly

Remove oil pan. See OIL PAN under **REMOVAL & INSTALLATION** . Remove bolt securing oil pump to rear main bearing cap. Remove oil pump and extension shaft. Remove extension shaft and retainer from oil pump. Disassemble oil pump. DO NOT remove pick-up tube unless loose or broken.

Inspection

1. Replace extension shaft retainer if cracked. Inspect components for damage. Measure depth and diameter of gear housing. Measure gear diameter and gear length. Measure gear lash (clearance between tip of gear teeth of both gears). Measure gear side clearance (clearance between tip of gear tooth and housing).
2. Using straightedge and feeler gauge, measure gear end clearance (clearance between cover plate and gear). Determine clearance between pressure regulator valve and bore. If clearances are not within specification, replace components as necessary. See OIL PUMP SPECIFICATIONS table.

CAUTION: Before installing gears, pack oil pump cavities with petroleum jelly to prime pump. Use only original equipment gaskets when assembling oil pump, as gasket thickness is critical. Pick-up tube must be replaced if removed.

Reassembly & Installation

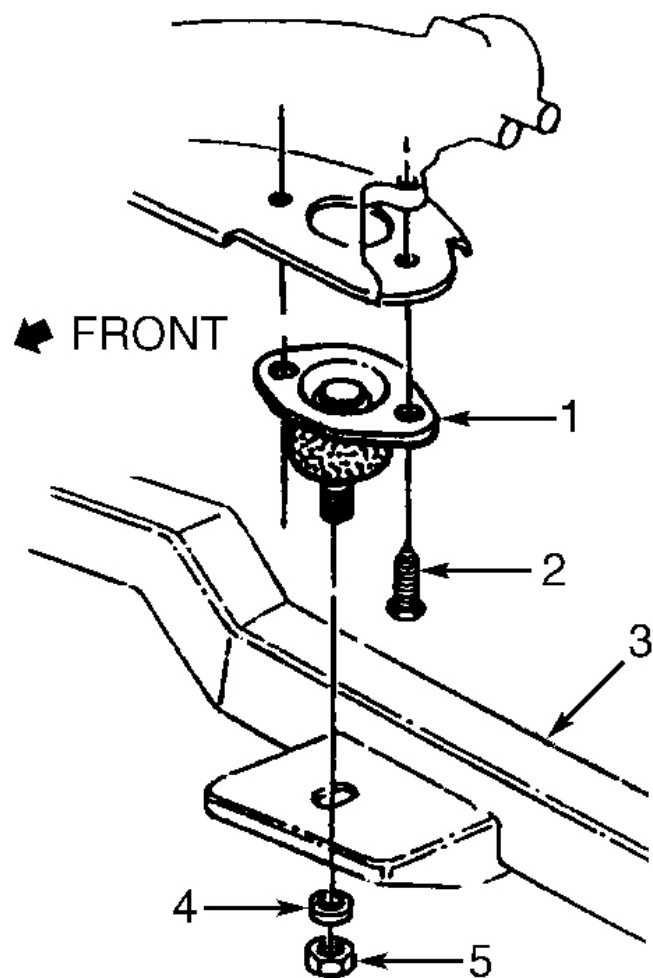
To reassemble, reverse disassembly procedure. If pickup tube was removed apply Sealant (1050026) to MEW tube before installing it into oil pump. Install pick-up tube using Tube Installer (J-8369). To keep extension shaft retainer from cracking, heat it in hot water before installing it onto oil pump. To install, reverse removal procedure. Tighten oil pump bolt to specification. See **TORQUE SPECIFICATIONS** .

OIL PUMP SPECIFICATIONS

Application	In. (mm)
Gear	
Diameter	1.498-1.500 (38.05-38.10)
End Clearance	.002-.007 (.05-.18)
Lash	.004-.008 (.10-.20)
Length	1.199-1.200 (30.45-30.48)
Side Clearance	.0015-.0040 (.038-.102)
Gear Housing	
Depth	1.195-1.198 (30.36-30.44)
Diameter	1.503-1.506 (38.18-38.25)
Valve-To-Bore Clearance	.0015-.0035 (.038-.089)

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1. Rear Engine Mount (Transmission)
2. Bolt - 33 ft. lbs. (45 N.m)
3. Transmission Support
4. Washer
5. Nut - 33 ft. lbs. (45 N.m)

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Fig. 11: Tightening Engine Mounts (S10 Pickup)
Courtesy of GENERAL MOTORS CORP.

TORQUE SPECIFICATIONS

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TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
A/C Compressor Bracket-To-Engine Bolts	67 (91)
Camshaft Sprocket Bolts	96 (130)
Connecting Rod Nuts	38 (52)
Crankshaft Pulley & Hub-To-Crankshaft Bolts	77 (104)
Crankshaft Pulley-To-Hub Bolts	37 (50)
Cylinder Head Bolts ⁽¹⁾	
Step 1	
Head Bolts "A"	46 (62)
Head Bolts "B"	43 (58)
Step 2	Additional 90 Degrees
Engine Mounts ⁽²⁾	
Mount-To-Block Bolts	39 (53)
Mount Through Bolts	38 (51)
Exhaust Manifold Nuts	22 (30)
Exhaust Pipe-To-Manifold Nuts	18 (24)
Flexplate/Flywheel-To-Crankshaft Bolts ⁽³⁾	55 (75)
Intake Manifold	
Lower Manifold-To-Cylinder Head Nuts ⁽⁴⁾	24 (33)
Upper Manifold-To-Lower Manifold Bolts	22 (30)
Main Bearing Cap Bolts	70 (95)
Oil Pump Bolts	32 (43)
Oil Pump Drive Bolts	18 (24)
Oxygen Sensor	31 (42)
Rocker Arm Nuts	22 (30)
Serpentine Bolt Tensioner Pulley Bolts	37 (50)
Timing Chain Tensioner Bolts	18 (24)
Water Pump Bolts	18 (24)
Water Pump Inlet	18 (24)
INCH Lbs. (N.m)	
Anti-Rotation Bracket Bolts	97 (11)
Camshaft Thrust Plate Bolts	106 (12)
Front Cover Bolts	97 (11)
Oil Pan Nuts/Bolts	89 (10)
Oil Pump Cover Bolts	89 (10)
Valve Cover Bolts	89 (10)

(1) Tighten in sequence. See **Fig. 5** .

(2) See **Fig. 11** .

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(3) Apply thread locking compound to bolts.

(4) Tighten in sequence. See **Fig. 2** .

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

GENERAL SPECIFICATIONS

Application	Specification
Displacement	134 Cu. In. (2.2L)
Bore	3.50" (89.0 mm)
Stroke	3.46" (88.0 mm)
Compression Ratio	9.0:1
Fuel System	MFI
Horsepower @ RPM	120 @ 5200
Torque Ft. Lbs. @ RPM	130 @ 4000

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS

Application	In. (mm)
Crankshaft End Play	.002-.007 (.05-.18)
Main Bearings	
Journal Diameter	2.4945-2.4954 (63.360-63.384)
Journal Out-Of-Round	.0002 (.005)
Journal Taper	.0002 (.005)
Oil Clearance	.0006-.0019 (.015-.047)
Connecting Rod Bearings	
Journal Diameter	1.9983-1.9994 (50.758-50.784)
Journal Out-Of-Round	.0002 (.005)
Journal Taper	.0002 (.005)
Oil Clearance	.0010-.0031 (.025-.079)

CONNECTING RODS

CONNECTING RODS

Application	In. (mm)
Maximum Bend	(1)
Maximum Twist	(1)

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Side Play	.004-.015 (.10-.38)
(1) Replace rod if any bend or twist exists.	

PISTONS, PINS & RINGS

PISTONS, PINS & RINGS

Application	In. (mm)
Pistons	
Clearance	.0006-.0018 (.015-.045)
Pins	
Diameter	.8000-.8002 (20.320-20.325)
Piston Fit	.0004-.0009 (.010-.022)
Rod Fit	.0010-.0017 (.025-.045)
Rings	
No. 1 & 2	
End Gap	.010-.020 (.25-.50)
Side Clearance	.002-.003 (.05-.08)
No. 3 (Oil)	
End Gap	.010-.050 (.25-1.27)
Side Clearance	.002-.008 (.05-.21)

CYLINDER BLOCK

CYLINDER BLOCK

Application	In. (mm)
Cylinder Bore	
Standard Diameter	3.5036-3.5043 (88.991-89.009)
Maximum Taper	.0005 (.013)
Maximum Out-Of-Round	.0005 (.013)
Maximum Deck Warpage	(1)
(1) If more than .010" (.25 mm) material must be removed from original surface of deck, replace cylinder block.	

VALVES & VALVE SPRINGS

VALVES & VALVE SPRINGS

Application	Specification
Valves	
Face Angle	45°
Head Margin (Minimum)	.031" (.80 mm)

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Face Runout (Maximum)	.0012" (.030 mm)
Valve Springs	
Free Length	1.94" (49.5 mm)
Out-Of-Square	.63" (1.6 mm)
Lbs. @ In. (kg @ mm)	
Pressure (Minimum)	
Valve Closed	75 @ 1.71 (34 @ 43.4)
Valve Open	220 @ 1.28 (100 @ 32.5)

CYLINDER HEAD**CYLINDER HEAD**

Application	Specification
Maximum Warpage	⁽¹⁾ .004" (.10 mm)
Valve Seats	
Intake Valve	
Seat Angle	46°
Seat Width	.049-.059" (1.25-1.50 mm)
Seat Runout (Maximum)	.002" (.05 mm)
Exhaust Valve	
Seat Angle	46°
Seat Width	.063-.075" (1.60-1.91 mm)
Seat Runout (Maximum)	.002" (.05 mm)
Valve Guides	
Intake Valve	
Stem-To-Guide Oil	
Clearance	.0010-.0027" (.025-.069 mm)
Exhaust Valve	
Stem-To-Guide Oil	
Clearance	.0014-.0032" (.035-.081 mm)
⁽¹⁾ If more than .010" (.25 mm) material must be removed from original surface of cylinder head, replace cylinder head.	

CAMSHAFT**CAMSHAFT**

Application	In. (mm)
Journal Diameter	1.868-1.8693 (47.45-47.48)
Lobe Lift	

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2.2L 4-CYL - VIN [4] 1996-97 ENGINES General Motors Corp. 2.2L 4-Cylinder VIN [4]

Intake	.2878 (7.309)
Exhaust	.2877 (7.307)
Oil Clearance	.0010-.0039 (.026-.101)